

REMARKS

1. Claim Status

Claims 15, 16, 18, 48, and 49 have been amended. Claims 2, 7-9, 14, 19, 32-34, 38, 40, and 47 are canceled. After entering the amendments, claims 1, 3-6, 10-13, 15-18, 20-31, 35-37, 39, and 41-46, 48-65 will be pending and under consideration.

2. Claim Amendments

Independent claim 18 has been amended to more clearly recite the processes for which the Applicants currently seek patent protection. Specifically, independent claim 18 now recites the step of “contacting an alcohol with an adsorbent capable of adsorbing water.” Support for this amendment may be found generally throughout the specification including at least, for example, paragraph 61.

Dependent claims 15 and 48 have been amended to more clearly recite the processes for which the Applicants currently seek patent protection. Specifically, these dependent claims now recite that the water content of the alcohol is minimized “by contacting the alcohol with an adsorbent capable of adsorbing water.” Support for this amendment may be found generally throughout the specification including at least, for example, paragraph 61.

Dependent claims 16 and 49 have been amended to provide a feature directed to adsorbents which may be utilized to adsorb water from the alcohol. Support for this amendment may be found generally throughout the specification including at least, for example, paragraph 61.

Applicants believe that no new matter has been introduced by the amendment to independent claim 18 and dependent claims 15, 16, 47, and 48.

3. Summary of Key Features of the Claims

The independent claims are directed to processes “to deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product” including a separation comprising “a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C.” Applicants have discovered that under particular olefin oligomerization product recovery conditions an alcohol deactivated halide-containing olefin oligomerization catalyst system will decompose. The decomposition of the alcohol deactivated halide-containing olefin oligomerization catalyst system

produces an acidic gas (paragraphs 57, 78, and 82) which in the long term leads to corrosion of the process equipment (paragraphs 57 and 87).

Applicants have discovered that the use of excessive heat when separating the alcohol deactivated halide-containing olefin oligomerization catalyst system from the olefin oligomerization product (and/or byproducts) via distillation will lead to alcohol deactivated halide-containing olefin oligomerization catalyst system decomposition (paragraphs 57, 80, 83, 84, Figures 1 and 2, among other places). Applicants have unexpectedly discovered that having a lower reboiler temperature (e.g. less than 190 °C) limits the decomposition of the alcohol deactivated halide-containing olefin oligomerization catalyst system (paragraphs 80, 83 and 84, among other places).

Applicants have also unexpectedly discovered that the presence of water in the alcohol utilized to deactivate the halide-containing olefin oligomerization catalyst system will exacerbate alcohol deactivated halide-containing olefin oligomerization catalyst system decomposition (paragraph 60, 88, 89, and Figure 3 among other places). Applicant have also unexpectedly discovered that the quantity of water present deactivation alcohol decreases the temperature at which the decomposition of the deactivated halide-containing olefin oligomerization catalyst system will occur (paragraphs 60, 88, 89, and Figure 3, among other places). Applicants have discovered that the minimization of water in the alcohol reduces or eliminates the lowering of the temperature at which the deactivated halide-containing olefin oligomerization catalyst system substantially decomposes.

The formation of halide gas during the recovery of the olefin oligomerization product will lead to corrosion of the olefin oligomerization product recovery equipment. This corrosion reduces the useful lifetime of the equipment. Since production plants are designed for decades of operation, the solutions represented by the pending claims would significantly impact the economics of an olefin oligomerization plant via extending the useful lifetime of the olefin oligomerization recovery equipment.

4. 35 U.S.C. § 103 Claim Rejections

Claims 1, 3-6, 10-13, 15-18, 20-31, 35-37, 39, 41-46, and 48-65 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Lashier et al., U.S. Patent 5,689,028 (hereafter “Lashier”), Araki et al., U.S. Patent 5,750,816 (hereafter “Araki”), and Kreischer et al., U.S. Patent 6,380,451 (hereafter “Kreischer”), considered separately. The Office Action dated October 15, 2008 (hereafter “Office Action”), states that the processes of Lashier, Araki, and Kreischer appear “indistinguishable from the claimed processes” and that applicants arguments “that the previous Office Action has failed to present a *prima facie* case of obviousness . . . are not deemed to be persuasive.” Specifically, the Office Action

opines that it is obvious to utilize a “reboiler temperature of less than 190 °C” as in independent claims 1, 18, 37, and 57. Applicants respectfully traverse these rejections.

a. 35 U.S.C. § 103 Claim Rejections – Claims 1, 18, 37, 57 – Reboiler Temperature

In relation to independent claims 1, 18, 37, and 57 the Office Action provides statements regarding the patentability of the independent claims. Specifically, the Office Action states that:

- Lashier, Araki, and Kreischer teach that “after catalyst deactivation, the olefin product can be removed by any removal process, preferably distillation”
- Lashier, Araki, and Kreischer teach that “any reaction conditions which can affect the above mentions steps are useful, and removal of the olefin products(s) by distillation was an above mentioned step”
- “reaction conditions are assumed to include temperature and pressure” and
- “any reaction condition which can affect the above mentioned step, include separation of the same product(s) by distillation, can be used”

to support the two conclusions that either:

- “the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” and/or
- “the reboiler temperature of less than 190 °C most likely was also used since no decomposition of the catalyst system and no corrosion of the process equipment was taught.”

Applicants respectfully submit that these statements and conclusion do not present a case of obviousness in regards to independent claims 1, 18, 37, and 57.

First, while Lashier, Araki, and Kreischer do teach that distillation may be utilized to separate an olefin oligomerization product from an alcohol deactivated olefin oligomerization catalyst system, none of these references, either singly or in any combination, teach the claimed reboiler temperatures. This fact is admitted in the present and previous Office Actions. By itself, the general teaching of distillation to the separation of an olefin oligomerization product in respect to present independent claims 1, 18, 37, and 57 is the description of a genus while the independent claims 1, 18, 37, and 57 are directed to a species. The MPEP and at least one court case specifically indicate that species are patentable over a genus. Specifically, MPEP § 2144.08 states that the “fact that a claimed species or subgenus is encompassed by a

prior art genus is not sufficient by itself to establish a *prima facie* case of obviousness while *In re Jones*, 958 F.2d 347, 350, 21 USPQ2d 1941, 1943 (Fed. Cir. 1992) provides that the “Federal Circuit has ‘declined to extract from *Merck & Co. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir. 1989) the rule that . . . regardless of how broad, a disclosure of a chemical genus renders obvious any species that happens to fall within it.” Consequently, independent claims 1, 18, 37, and 57 can not be held as obvious on this basis alone.

The Office Action attempts to cure this deficiency by asserting that reaction conditions disclosed within Lashier, Araki, and Kreischer may be read upon the conditions of the feature “wherein a separation comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C.” Applicants respectfully submit that this assertion is in clear error.

Review of Lashier, Araki, and Kreischer makes clear that Lashier, Araki, and Kreischer make a distinction between reaction methods (and/or conditions utilized to produce the olefin oligomerization product) and olefin oligomerization product recover methods (and/or conditions utilized to separate and purify the olefin oligomerization product). First, Lashier and Kreischer clearly separates their respective overall processes into at least reaction conditions (column 4, line 64, bridging column 5, line 43 and column 7, line 40, bridging column 8, line 67, respectively), catalyst deactivation (column 5, line 53, bridging column 6, line 21 and column 9, line 1-62, respectively), and product recovery (column 9, lines 22-25, and column 9, line 63, bridging column 10, line 8, respectively) among other steps (e.g. catalyst preparation, waste product stream treatment, among others). Second, Araki clearly separates the discussion of reaction conditions (column 6, line 51, bridging column 9, line 15) and product recovery conditions (column 9, line 16 bridging column 14, line 45). Furthermore, one of ordinary skill in the art recognizes that reactions conditions, such as those for the described oligomerization reaction, and the conditions for product recovery involve totally different considerations. For example, in the trimerization of ethylene to 1-hexene, the oligomerization ethylene pressures are kept high to provide adequate concentration of ethylene for the reaction while distillation equipment pressure is usually maintained around atmospheric pressure (or lower) to avoid high costs of equipment necessary to contain pressures significantly in excess of atmospheric temperature. In relation to temperature, reaction temperatures are dictated by catalyst activity and stability, among other considerations, while distillation temperatures are dictated by the boiling points of the materials being separated. Additionally, increasing distillation pressure increases the distillation temperature and temperatures of material passed through the reboiler: which is in the opposite direction of the proposed solution. Consequently, reaction conditions can not be applied to product recovery/distillation conditions and statements attempting to read reaction conditions

upon recovery/distillation conditions would be a clear error. Consequently, independent claims 1, 18, 37, and 57 can not be held as obvious based upon on the disclosure of a reaction condition encompassing or overlapping a claimed product recovery temperature of material passed through a reboiler of a distillation.

Even if grounds for reading reaction conditions upon recovery/distillation conditions, without conceding that such grounds exist, could be applied in this instance, or would be proper, the MPEP and the courts have established that a specific range may be patentable. Specifically, MPEP § 2144.05 II A states that “[g]enerally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical” (emphasis added), MPEP § 2144.05 II B provides that a “particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation,” and MPEP § 2144.05 III provides that “Applicants can rebut a *prima facie* case of obviousness based on overlapping ranges by showing the criticality of the claimed range” or a “*prima facie* case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention.” These MPEP passages are supported by at least these three court decisions:

- *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) – “The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.”
- *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990) – “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.”
- *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004) - “Applicant can rebut a presumption of obviousness based on a claimed invention that falls within a prior art range by showing ‘(1) [t]hat the prior art taught away from the claimed invention...or (2) that there are new and unexpected results relative to the prior art.’”

In this instance, Applicants respectfully submit that the claimed temperature for material passed through the reboiler is a critical result-effective variable, achieves an unexpected result, and that the prior art teaches away from the claimed temperature.

First, paragraphs 57, 80, 83, 84, Figures 1 and 2, among other places, of the instant patent application, shows that the temperature for material passed through the reboiler is a result-effective variable impacting the decomposition of an alcohol deactivated halide-containing olefin oligomerization catalyst system. Additionally, paragraphs 80, 83, and 84, among other places, of the instant patent application, shows that maintaining the temperature for material passed through a reboiler below about 190 °C unexpectedly, and significantly, impacts the decomposition of the alcohol deactivated halide-containing olefin oligomerization catalyst system and that this temperature is critical.

Second, Araki teaches away from using the claimed temperature for material passed through the reboiler in Examples 1 (see Table 1), Example 3, and Example 10. These examples utilize heater/heating pipe temperatures of 230 °C, 200°C, and 200 °C, respectively. This heater/heating pipe temperatures would likely lead to material passed through the reboiler exceeding a temperature of 190 °C as recited in independent claims 1, 18, 37, and 57, or in the alternative, would likely lead to material passed through the reboiler exceeding 175 °C as recited in dependent claims 10, 35, and 39.

In respect to the Office Action conclusion regarding the temperature at which material is passed through the reboiler, Applicants respectfully submit that the Office Action has not sufficiently shown that “the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” and that a “reboiler temperature of less than 190 °C most likely was also used since no decomposition of the catalyst system and no corrosion of the process equipment was taught.” First, the previously mentioned Araki examples expressly rebut the Office Action conclusion that “the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” and “the reboiler temperature of less than 190 °C most likely used.” If a skilled artisan knew what reboiler temperature to use and that the temperature would be less than 190 °C, as alleged by the Office Action, one must address why Araki used temperatures which would lead to material passing through a reboiler exceeding the claimed temperature (190 °C or 175 °C, depending upon the specific claim)? Araki provides no reasoning on why the heater/heating pipe temperatures of 230 °C, 200°C, and 200 °C were utilized. Consequently, it must be believed that Araki did not believe that these temperatures were important in relation to recovering product from an alcohol deactivated halide-containing olefin oligomerization catalyst system. In light of

Araki, absence of specific teachings in Lashier and Kreischer, as admitted in the Office Action, cast significant doubt on whether Lashier and Kreischer knew what temperatures to utilize.

Second, Applicants instant application indicates that these Araki examples would result in decomposition of an alcohol deactivated halide-containing olefin oligomerization catalyst system. The absence of a Araki teaching on this subject, in addition to Lashier and Kreischer, may be explained by the supposition that 1) these references did not know that an alcohol deactivated halide-containing olefin oligomerization catalyst system would decompose at recovery/distillation reboiler temperatures and thus did not perform any tests to monitor the decomposition of a alcohol deactivated halide-containing olefin oligomerization catalyst system or corrosion to indicate the decomposition, and/or 2) since corrosion is cumulative and a long term issue, the time scale for the experiments of Lashier, Araki, or Kreischer were not sufficient time to observe corrosion as evidence for the decomposition of an alcohol deactivated halide-containing olefin oligomerization catalyst system, among other explanations.

Finally, these two Office Action conclusions represent a statement that Lashier, Araki, and Kreischer inherently teach the claimed process including the step of separating a product stream from a stream containing an alcohol deactivate halide-containing olefin oligomerization catalyst system “wherein the separation comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C.” MPEP § 2112 IV establishes that “[t]he fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.” Additionally, *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981) provides that “[t]o establish inherency, the extrinsic evidence ‘must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.’”

The claimed temperature range at which material is passed through the reboiler is not inherently present in any of the cited references. First, as taught in Araki, the distillation to recover the reaction products includes heater/heating pipe temperatures of 200 °C or greater. Lashier and Kreischer are silent on temperature at which material is passed through the reboiler. Consequently, Lashier and Kreischer may have used temperature at which material is passed through the reboiler of 200 °C or greater as well. Therefore, the only direct evidence present in the cited references is the use of heater/heating pipe temperatures above the claimed feature. This teaching leaves open the possibility that all of the cited references did not use the claimed feature to accomplish the distillation. Without direct evidence from

any of the cited references, the Examiner's belief, that Araki, Lashier, or Kreischer utilized a separation comprising "a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C," is not sufficient evidence to establish that this feature is inherent in the cited references. Thus, Applicants believe that the prior art fails to inherently or expressly teach or suggests all of the limitations of independent claims 1, 18, 37, and 57.

For the above-cited reasons, Applicants respectfully submit that the Office Action has failed to present a case of obviousness in relation to the pending independent claims 1, 18, 37, and 57. Consequently, independent claims 1, 18, 37, and 57, and any claim which depends therefrom, claims 3-6, 10-13, 15-17, 20-31, 35-36, 39, 41-46, 48-56, and 58-65, are allowable over the cited references. Applicants respectfully request that the 35 U.S.C. § 103 rejections of the pending claims in view of Lashier, Araki, and Kreischer considered separately be withdrawn.

**b. 35 U.S.C. § 103 Claim Rejections – Claims 18, 15, 47, and 48 – Minimizing Water
Content of Olefin Oligomerization Catalyst System Deactivation Alcohol**

In relation to independent claim 18 and dependent claims 15, and 48, Applicants note that the Office Action has not provided a formal rejection relating to the feature of "minimizing the water content of the alcohol . . . by contacting the alcohol with an adsorbent capable of adsorbing water." The only argument related to this feature in the Office action is a general statement that within Lashier that "[n]o water content in the alcohol component is disclosed so the examiner is of the position that water-free alcohols are used."

Applicants respectfully submit that this Office Action conclusion represents a statement that Lashier inherently teaches using water-free alcohols. As previously provided herein, inherency is not established by probabilities or possibilities. Consequently, this statement alone is not sufficient to establish a *prima facie* case of obvious as to independent claim 18 (and its dependents) and dependent claims 15 and 48 (and their dependents). Additionally, independent claim 18 and dependent claims 15 and 48 recite a positive step of "minimizing the water content of the alcohol . . . by contacting the alcohol with an adsorbent capable of adsorbing water" (emphasis added). Lashier, Araki, and/or Kreischer do not teach or suggest "minimizing the water content of the alcohol . . . by contacting the alcohol with an adsorbent capable of adsorbing water." Furthermore, one of ordinary skill in the art recognizes that water would also deactivate a halide-containing olefin oligomerization catalyst system. As such, one of ordinary skill in the art would not consider the presence of water in an alcohol used to deactivate the catalyst system to be detrimental in the deactivation of a halide-containing olefin oligomerization catalyst system. Consequently, the lack of a mention of deactivating alcohol water content is not surprising and can not

form the basis for an assumption that water-free alcohol was used. Consequently, Lashier do not make clear that the feature of “minimizing the water content of the alcohol . . . by contacting the alcohol with an adsorbent capable of adsorbing water” is necessarily present and the opinion that water-free alcohol is not proof that water free alcohol was used. Consequently, Lashier does not address each and every limitation of independent claim 18 and dependent claims 14 and 48.

Applicants would also like to draw attention to Figure 3. This figure shows that the presence of water exacerbates deactivated catalyst decomposition by a further lowering of the temperature at which the deactivated catalyst system begins to significantly decompose. Consequently, the step of minimizing the water content of the alcohol used to deactivate the catalyst system is a result-effective variable that has a surprising and material effect on the olefin oligomerization recovery process and can represent a patentable feature of a claim.

For the above-cited reasons, Applicants respectfully submit that the Office Action has failed to present a case of obviousness in relation to the pending independent claim 18 (and its dependents) and dependent claims 15 and 48 (and their dependents) and these claim are allowable over the cited references. Applicants respectfully request that the rejection of claims 15, 16, 18, 20-21, 24, 25, 27-31, 35-36, 48, 49, 51, 53, and 56 be withdrawn.

5. Final Remarks

In commenting upon the cited references and the pending claims, certain details of distinction between the cited references and the pending claims have been mentioned to facilitate a better understanding of the claimed invention. The unclaimed distinctions are not intended to create any implied limitations in the claims. Additionally, not all distinctions between the cited references and Applicants' present invention have been presented by the Applicants. Applicants reserve the right to submit additional evidence demonstrating that Applicants' invention is novel and nonobvious in view of the cited references.

The foregoing remarks are intended to assist the Examiner in re-examining the application and, in the course of explanation, may employ shortened, more specific, or variant descriptions of some of the claim language. Such descriptions are not intended to limit the scope of the claims. The actual claim language should be considered in each case. Furthermore, the remarks only represent certain advantageous features and differences between the pending claims and the cited references that Applicants' attorney chooses to mention at this time. The remarks should not be considered exhaustive to all features which render the invention patentable.

Consideration of the amended claims is respectfully requested. In view of the foregoing remarks and the Office Action cited references, Applicants respectfully submit that the amended claims under consideration are in condition for allowance. The Examiner is invited to contact the undersigned patent attorney at (832) 813-4561 with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,

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